

CLAIMS

1. A vehicle wheel bearing comprising:
 - a) a vehicle-wheel-bearing non-rotatable section;
 - b) a vehicle-wheel-bearing rotatable section rotatably attached to the non-rotatable section, wherein at least one of the non-rotatable and rotatable sections includes at least a portion of an inboard bearing seal, wherein at least one of the non-rotatable and rotatable sections includes at least a portion of an outboard bearing seal, and wherein the outboard bearing seal is spaced apart from the inboard bearing seal; and
 - e) at least one sensor disposed between the inboard and outboard bearing seals and having an output used for determining at least one component of a force applied to the rotatable section.
2. The vehicle wheel bearing of claim 1, wherein the determined at-least-one component is an input to a vehicle control system.
3. The vehicle wheel bearing of claim 2, wherein the output is used for determining three mutually orthogonal components of the force.
4. The vehicle wheel bearing of claim 1, wherein the at-least-one sensor includes a stress-based load sensor.
5. The vehicle wheel bearing of claim 1, wherein the rotatable section includes a first race, wherein the non-rotatable section includes a second race, wherein the first and second races define a raceway, wherein the vehicle wheel bearing also includes rolling elements disposed in the raceway, and wherein the at-least-one sensor senses the passage of the rolling elements around the raceway past the at-least-one sensor.

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6. The vehicle wheel bearing of claim 1, wherein the at-least-one sensor measures the distance between the non-rotatable and rotatable sections.
7. The vehicle wheel bearing of claim 1, wherein the at-least-one sensor measures temperature.
8. A vehicle wheel bearing comprising:
 - a) a vehicle-wheel-bearing non-rotatable section;
 - b) a vehicle-wheel-bearing rotatable section rotatably attached to the non-rotatable section; and
 - c) at least one sensor attached to at least one of the non-rotatable and rotatable sections and having an output used for determining at least one component of a force applied to the rotatable section, wherein the rotatable section includes a first race, wherein the non-rotatable section includes a second race, wherein the first and second races define a raceway, wherein the vehicle wheel bearing also includes rolling elements disposed in the raceway, and wherein the at-least-one sensor senses the passage of the rolling elements around the raceway past the at-least-one sensor.
9. The vehicle wheel bearing of claim 8, wherein the at-least-one sensor is attached to the second race.
10. The vehicle wheel bearing of claim 8, wherein the at-least-one sensor is permanently attached to the second race.
11. The vehicle wheel bearing of claim 8, wherein the determined at-least-one component is an input to a vehicle control system.

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12. A vehicle wheel bearing comprising:

a) a vehicle-wheel-bearing non-rotatable section;

b) a vehicle-wheel-bearing rotatable section rotatably attached to the non-rotatable section; and

5 c) at least one sensor attached to at least one of the non-rotatable and rotatable sections and having an output used for determining at least one component of a force applied to the rotatable section, wherein the at-least-one sensor measures the distance between the non-rotatable and rotatable sections.

13. The vehicle wheel bearing of claim 12, wherein the non-rotatable section includes a hub, and wherein the at-least-one sensor is attached to the hub.

14. The vehicle wheel bearing of claim 13, wherein the at-least-one sensor is permanently attached to the hub.

15. The vehicle wheel bearing of claim 12, wherein the determined at-least-one component is an input to a vehicle control system.

and
a,
16. A vehicle wheel bearing comprising:

a) a vehicle-wheel-bearing non-rotatable section;

b) a vehicle-wheel-bearing rotatable section rotatably attached to the non-rotatable section; and

5 c) at least one sensor attached to at least one of the non-rotatable and rotatable sections and having an output used for determining at least one component of a force applied to the rotatable section, wherein the at-least-one sensor measures temperature.

17. The vehicle wheel bearing of claim 16, wherein the non-rotatable section includes a hub, and wherein the at-least-one sensor is attached to the hub.

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18. The vehicle wheel bearing of claim 17, wherein the at-least-one sensor is permanently attached to the hub.

19. The vehicle wheel bearing of claim 16, wherein the determined at-least-one component is an input to a vehicle control system.

20. A method for controlling a vehicle having a wheel bearing including a non-rotatable section, including a rotatable section rotatably attached to the non-rotatable section, and including rolling elements disposed between the non-rotatable and rotatable sections, wherein the method comprises the steps of:

5 a) attaching at least one sensor to at least one of the non-rotatable and rotatable sections, wherein the at-least-one sensor measures at least one of the passage of the rolling elements, the distance between the non-rotatable and rotatable sections, and a temperature, and wherein the at-least-one sensor has an output;

10 b) determining at least one component of a force applied to the rotatable section from the output of the attached at-least-one sensor of step a); and

 c) controlling the vehicle based at least in part on the determined at-least-one component of step b).

21. The method of claim 20, wherein step b) determines three mutually orthogonal components of the force.